Associations Between Sexuality Education in Schools and Adolescent Birthrates:

A State-Level Longitudinal Model

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Abstract

Objective—To examine the impact of sexuality education practices on adolescent birthrates while controlling for demographic characteristics and religious/ political factors at a state level.

Design—Prospective cohort study.

Setting—Twenty-four states, from 1997 through 2005.

Participants—Girls aged 15 to 17 years.

Main Exposure—The state sexuality education practices (ie, sexually transmitted disease prevention, pregnancy prevention, condom efficacy) for 1996 through 2004 from the Centers for Disease Control and Prevention School Health Profiles Survey.

Main Outcome Measures—State birthrates for girls aged 15 to 17 years for 1997 through 2005 from the Centers for Disease Control and Prevention.

Results—In a longitudinal, unadjusted model, our findings provide evidence that increased sexuality education within school curricula is associated with lower adolescent birthrates (average sexuality education topics β=−0.61; *P*=.001). However, the effect of sexuality education disappeared when taking into consideration the demographic characteristics, religiosity, and abortion policies of the state (average sexuality education topics β=−0.12; *P*=.26). States with higher religiosity rankings and greater political conservatism had higher adolescent birthrates.

Conclusions—The effects of sexuality education were constrained by state characteristics and do not independently explain the considerable variations in adolescent birthrates found across states. Our findings underscore the strong influence of state characteristics on adolescent birthrates above and beyond sexuality education, which must be considered when evaluating the efficacy of sexuality education programs.

By and large, US adolescent birthrates have been on the decline. From 1960 to the mid-1980s, adolescent birthrates gradually decreased by nearly 50%.[1–3] Progress stalled between 1985 and 1990, when adolescent birthrates increased by almost 20%. However, starting in 1991, adolescent birthrates restarted a significant and steady decrease (by 30%) that discontinued only briefly in 2006 and 2007.[4] In 2008, adolescent birthrates again decreased. Finally, in 2009, the rates hit the lowest point since records began 70 years ago, down 6% from the 2008 rate to 39.1 births per 1000 adolescent girls aged 15 to 19 years.[5] Still, the United States remains disproportionately affected by the rate of adolescent births compared with other developed countries. As a comparison, the United Kingdom has the highest adolescent birth-rate in Europe, but it is only approximately half the adolescent birthrate in this country (2007 data: United Kingdom=26.7 births per 1000 girls aged 15–19 vs United States = 42.5 births).[6,7] Similarly, the US adolescent birthrate is about *10 times* as high as that in Switzerland (4.3 per 1000), which has the lowest adolescent birthrate in Europe.

Adolescents and parents agree that school-based programs should be an important source of formal education for adolescent sexual health.[8,9] Yet, the literature examining the efficacy of current school-based sexuality education programs is mixed.[10–16] In 2010, a systematic review of abstinence education studies found *insufficient evidence* to support the intervention on the basis of inconsistent results across studies.[17] A similar review of comprehensive sexuality education (ie, a strategy that promotes behaviors that prevent or reduce the risk of pregnancy, human immunodeficiency virus [HIV] infection, and other sexually transmitted infections) concluded efficacy in reducing sexual risk behaviors, including engagement in any sexual activity, frequency of sexual activity, number of partners, and frequency of unprotected sexual activity.[18] Limited direct evidence of effectiveness for reducing pregnancy, however, was found. In a related review, a number of sexuality education programs (using mostly comprehensive strategies) reduced adolescents' sexual risk behaviors but were less effective in reducing rates of adolescent pregnancy.[19] To better understand associations between school-based sexuality education programs and adolescent sexual behaviors, these programs must continue to be rigorously examined. In this study, we evaluated longitudinal associations between adolescent birthrates (ie, births to girls aged 15–17 years) from 1997 through 2005 and state-level sexuality education program components from 1996 through 2004 that are presumed to be influencing adolescent sexual risk behaviors.

METHODS

DEPENDENT VARIABLE: ADOLESCENT BIRTHRATES

Given the unexplainable uptick in adolescent birthrates that occurred in 2006 and 2007, we examined only state adolescent birth-rates for the years 1997 through 2005. State adolescent birth-rates were measured as the number of live births per 1000 girls aged 15 to 17 each year from 1997 through 2005, using data from the Centers for Disease Control and Prevention.[20] These rates are based on the birth certificates registered in all states and made available from the National Center for Health Statistics at the Centers for Disease Control and Prevention.

PRIMARY INDEPENDENT VARIABLE: SEXUALITY EDUCATION

Data from the School Health Profiles (Profiles) was used to determine the proportion of schools within a state that provided instruction on sexuality education.[21] In 1995, the Centers for Disease Control and Prevention, in collaboration with state and local education and health agencies, developed Profiles to biennially document practices of public secondary schools. The principal or the school's lead health education teacher completes the self-administered questionnaire. Response rates are 70% or greater, and appropriate documentation is weighted to reflect the likelihood of principals or teachers being selected and to adjust for differing patterns of nonresponse. We used 1996 through 2004 Profiles data; data for 2006 Profiles were excluded because of a marked difference from prior years in the way that the public-access data were calculated. Eligible states (listed in Table 1) were the 24 that participated in and had weighted data for at least 3 of the 5 Profiles years (1996, 1998, 2000, 2002, and 2004). Eight states participated in the Profiles with weighted data for 3 of the 5 years, 5 states for 4 years, and 11 states for all 5 years.

Participants were queried: "During this school year, have teachers in this school tried to increase student knowledge on each of the following topics in a required health education course in any of grades 6 through 12?" Responses were yes or no on various sexuality education topics listed in Table 2. We also used an overall measure of sexuality education instruction for each state to represent an average score across all 13 sexuality education topics (hereafter referred to as the states' average score of all topics taught).

OTHER INDEPENDENT VARIABLES

The state-level poverty rate, race/ethnicity, and violent crime rate were considered in the analysis on the basis of existing literature that correlates them with adolescent sexual risk taking.[22,23] The percentage of children younger than 18 who live under the poverty threshold, as defined by the US Office of Management and Budget, was accessed from the Census Bureau's small-area income and poverty estimate files.[24] Adolescent race/ethnicity distribution was obtained by the Surveillance, Epidemiology, and End Results Program. The annual state-level violent crime rate (ie, murder, rape and sexual assault, robbery, and assault) was retrieved from the Bureau of Justice Statistics online data bank (http:// bjs.ojp.usdoj.gov), which is obtained from the Federal Bureau of Investigation's Uniform Crime Reports and documented at a rate per 100 000 population.

Variables reflecting the state's religious and political climate included the following 3 factors. First, an index score of religiosity from the US Religious Landscapes Survey, published by the Pew Forum on Religion and Public Life, was used. The Pew survey was a telephone survey conducted during 2007 and 2008 (35 957 participants). Following methods published elsewhere,[25] we used the average percentage of respondents in each state who endorsed the most religious answer across 8 questions about religion. Second, the political climate was an annual measure of state-level citizen preferences on a liberal-conservative scale.[26] Third, the 2005 adolescent abortion law for each state (parental consent, parental notification, no law, law enjoined, or minor allowed) was also considered.[27]

All procedures were approved by the Washington University Institutional Review Board.

STATISTICAL ANALYSIS

State adolescent birthrates over time (1997 through 2005) were modeled using linear mixed-effects models for repeated measures (repeated observations nested within states). The primary predictor was the annual percentage of schools within a state teaching sexuality education topics. Sexuality education topics were lagged 1 year for odd years and 2 years for even years (eg, 1996 Profiles data were used for 1997 and 1998, and 1998 Profiles data were

used for 1999 and 2000). Because 2006 Profiles data were not used, 2004 Profiles were used for 3 years of data: 2005, 2006, and 2007. The relationship between the overall average of the sexuality education topics and adolescent birth-rates was examined. In addition, the relationship between each specific sexuality education topic and adolescent birthrates was examined in separate univariate models. The year was included in the model to account for trends in adolescent birthrates that could not be explained by any of our measured variables over time. A quadratic polynomial trend was used because it fit the birthrate data better than a linear trend. Then, we adjusted for the demographic characteristics of the state as a block, and lastly we adjusted for the state religious/political climate variables as a block. For time-varying covariates (ie, the sex education variables, race, violent crime, and poverty), to separate the effects of differences within states over time (ie, within-state effects) and the effects of differences between states (ie, between-state effects), we included both the state's mean on the time-varying covariate (ie, a between-states variable) and the state's time-varying deviation around its mean (ie, a within-states variable) in the model.[28] Models included a random effect for state. A first-order antedependence covariance structure was used. $P<.05$ was considered statistically significant. We used SAS, version 9.2 (SAS Institute, Inc), for statistical analyses.

RESULTS

From 1996 through 2004, most of the 24 states had relatively high percentages of schools teaching sexuality education topics, except for how to use a condom, which was taught to a much lower degree (Table 2).

In 1997, the mean (SD) birthrate for girls aged 15 to 17 years old was 25.6 (8.4) births per 1000 girls; this gradually decreased to 17.7 (5.4) births per 1000 girls in 2005 (Figure). Other state demographic and political variables are presented averaged over time by state in Table 1. New Hampshire had the lowest mean adolescent birthrate during the study period (9.7 births per 1000 girls), whereas Arkansas had the highest (34.8). Alaska had the lowest average score of all sexuality education topics taught (68.8%), whereas New York had the highest (91.0%).

There was a significant inverse relationship between a state's religiosity and the percentage of schools in the state teaching condom efficacy or how to correctly use a condom (averaged over time), indicating the more religious the state, the less condom education was taught (condom efficacy $r=-0.48$; $P=.02$; correct condom use $r=-0.58$; $P=.003$). The political ideology of a state was significantly associated with most of the sexuality education topics (significant r ranged from 0.43 to 0.68), indicating that the more liberal the state, the more sexuality education topics were taught. Political ideology was explored as a potential covariate in multivariable models but was not retained in the analysis because it was highly correlated with the sexuality education topics.

Results are presented in Table 3 for within- and between-state effects for each sexuality education topic, first in univariate analysis and then in a multivariable analysis that adjusts for time trend, state demographic variables, and state religious/abortion law variables, in that order. For time-varying covariates, within-state effects are represented in the model by the state's time-varying deviation around its mean, and between-state effects are represented in the model by the state's mean on the time-varying covariate. Adolescent birthrates over time could not be explained by within-state changes in most of the sexuality education topics over time, evidenced by the nonsignificance of the within-state effects of the sexuality education topics even in univariate analysis. The within-state effect of HIV infection prevention became significant in the final model, indicating that increasing education on HIV infection prevention within a state over time is associated with lower birthrates. Two

states, Alabama and Idaho, increased their HIV infection prevention education over time to nearly perfect so that essentially all schools taught HIV infection prevention (Alabama from 94% to 100% and Idaho from 92% to 99%) and were thus influential in this finding. These states were not excluded from the model; however, more years of data with more states exhibiting changes in this topic over time may be necessary to validate these findings.

Many significant associations were found for between-state effects in univariate analysis. States with higher average percentages of schools teaching sexuality education topics had lower birthrates on average. Significant associations between sexuality education topics and adolescent birthrates were found for the states' average score of all topics taught and for 8 of the 13 topics (ie, HIV infection prevention, pregnancy prevention, sexually transmitted disease prevention, abstinence as the most effective method to avoid HIV infection, how HIV is transmitted, condom efficacy, how to correctly use a condom, and human sexuality). For example, a 1% increase in the states' average score of all topics taught was associated with 0.6 fewer births per 1000 girls aged 15 to 17 years (P=.001).

Adding time trend to the model had a minimal effect on the associations between the sexuality education topics and adolescent birthrates (step 1); however, for many of the sexuality education topics, the between-state effects lost significance when adjusting for both time trend and the demographic characteristics of the state (step 2). Specifically, this pattern was observed for HIV infection prevention, pregnancy prevention, sexually transmitted disease prevention, abstinence, how HIV is transmitted, and human sexuality. In the final step (step 3), adding the religious/abortion law variables to the model eliminated the remaining significant between-state effects for the states' average score of all topics taught and how to correctly use a condom. The between-state effect of condom efficacy changed from being associated with lower adolescent birthrates to being associated with higher birth-rates when adding the religiosity and abortion law variables. The strong correlation of religiosity and abortion laws with condom efficacy may be causing the effect to turn in the opposite direction. The between-state effect of the influence of alcohol/drugs on HIV-related risk behaviors becomes significant when adjusting for all covariates, indicating that states teaching this topic in more schools have lower birthrates. This may be a true finding; however, this topic was queried only in the year 2002 and beyond, resulting in a model using only 3 years of data. This finding would need validation with more data. Of note, Delaware was excluded from specific HIV topic models (ie, HIV infection prevention, abstinence to avoid HIV, how HIV is transmitted, number of young people who contract HIV, and how to find information related to HIV) because it was disproportionately influential, indicated by large residuals (predicted adolescent birth-rates were much lower than observed adolescent birth-rates), large Cook's distance values, and large fixed-effects deletion estimates for these sexuality education topics.

Many state characteristics were significantly associated with adolescent birthrates in the full models. As an illustration, we provide details on the model that included the states' average score of all topics taught. Within-state differences in race were significantly associated with birthrates; the higher the proportion of whites, the lower the birthrates (β=−0.58; P=.03). Between-state differences in poverty were also significant, with a higher average poverty level associated with a higher adolescent birthrate (β=0.56; P=.005). Higher religiosity of a state was associated with higher adolescent birthrates (β=0.25; P=.01). Compared with parental consent adolescent abortion laws, having no adolescent abortion law was significantly associated with lower adolescent birthrates (no law β =−7.2; P=.04).

COMMENT

Birthrates for girls aged 15 to 17 years at the time of birth varied significantly across the examined states by as much as a 3-fold difference (from 9.7 live births per 1000 adolescent girls to 34.8). Increased state adolescent birth-rates were associated with a higher proportion of poverty and minorities. In addition, conservative state characteristics (ie, higher religiosity and stricter abortion policies) were associated with higher adolescent birthrates.

Within states, sexuality education changed very little over time and few significant within-state effects were found. Greater differences are present between states in the sexuality education, and many significant associations were found for between-state effects when comparing adolescent birthrates and sexuality education in univariate analyses. These findings are consistent with reviews of comprehensive sexuality education that concluded efficacy in reducing youth sexual risk behaviors.[18]

Extending past reports by using a more comprehensive model of sexuality education, our main findings revealed that sexuality education was not associated with teen birthrates once religiosity measures and abortion policy were included in the analysis. Thus, the effects of sexuality education were constrained by state characteristics and do not independently explain the considerable variations in adolescent birthrates found across these states.

Separating the impact of state characteristics, such as social conservatism, religiosity, and abortion policy, from the impact of sexuality education on adolescent births is complex. Possibly states with more conservative political values and higher religiosity less fully implement the sexuality education programs, which in turn leads to higher adolescent birthrates. Another potential explanation is that the quality of sexuality education is similar across states but the educational messages are disregarded by adolescents who reside in more conservative and/or more religious states. Last, our findings may occur because adolescent girls who reside in states with more conservative political values and higher religiosity and stricter abortion policies are less likely to have an abortion compared with adolescent girls who reside in other states.

Regardless of the mechanism, there are some clear issues that states must face regarding adolescent births. First, births in girls aged 15 to 17 years are a public health issue with many potential adverse health and social consequences for mother and child. States with the highest conservative values paradoxically have the highest rate of adolescent births across these states and must pragmatically identify methods to reduce the rate of adolescent births. States with more conservative religious values and strict abortion policies can continue to support abstinence as the safest behavior, but we would urge that all states embrace comprehensive sexuality education. Even in states with conservative religious values and abortion restrictions, youth are becoming sexually active. These young girls must be knowledgeable about ways to protect themselves from unwanted pregnancy through the use of condoms or other contraceptives. Our findings underscore the strong influence of religiosity and abortion policies on adolescent birthrates above and beyond sexuality education. Policy makers, health care providers, researchers, and other key stakeholders must realistically address these confounding issues when evaluating and implementing sexuality education programs. The metric of the success or failure of the state policies should be the birthrate among 15- to 17-year-old girls.

The findings are limited by several factors. Foremost, findings are based on adolescent birthrates, not pregnancy rates. We opted to examine state-level birthrates over pregnancy rates because birthrates are based on highly complete, reliable, and accurate birth certificate data.[29] In comparison, state-level pregnancy data are released on an irregular basis. Moreover, the accuracy of pregnancy estimates relies on abortion and fetal loss data that are

much less current, complete, and reliable than birthrate data.[29] Also, we cannot measure the quality of sexuality education. Furthermore, we had weighted Profiles data for 24 states that include good geographic and cultural variety. The advantages of using the Profiles data are that these are of high quality and no other data set measures delivery of sexuality education by state. Last, our state-level analysis is correlational and potentially overlooks other important determinants.

Despite these limitations, the implications are significant. We found considerable variation in adolescent birth-rates across states. Teaching more sexuality education did not lower adolescent birthrates when accounting for state characteristics (ie, higher religiosity, stricter abortion policies, and sociodemographic characteristics). Thus, our findings suggest that religious and political values and related state-level social forces are important to consider in comprehensive analysis when examining the efficacy of sexuality education programs.

Acknowledgments

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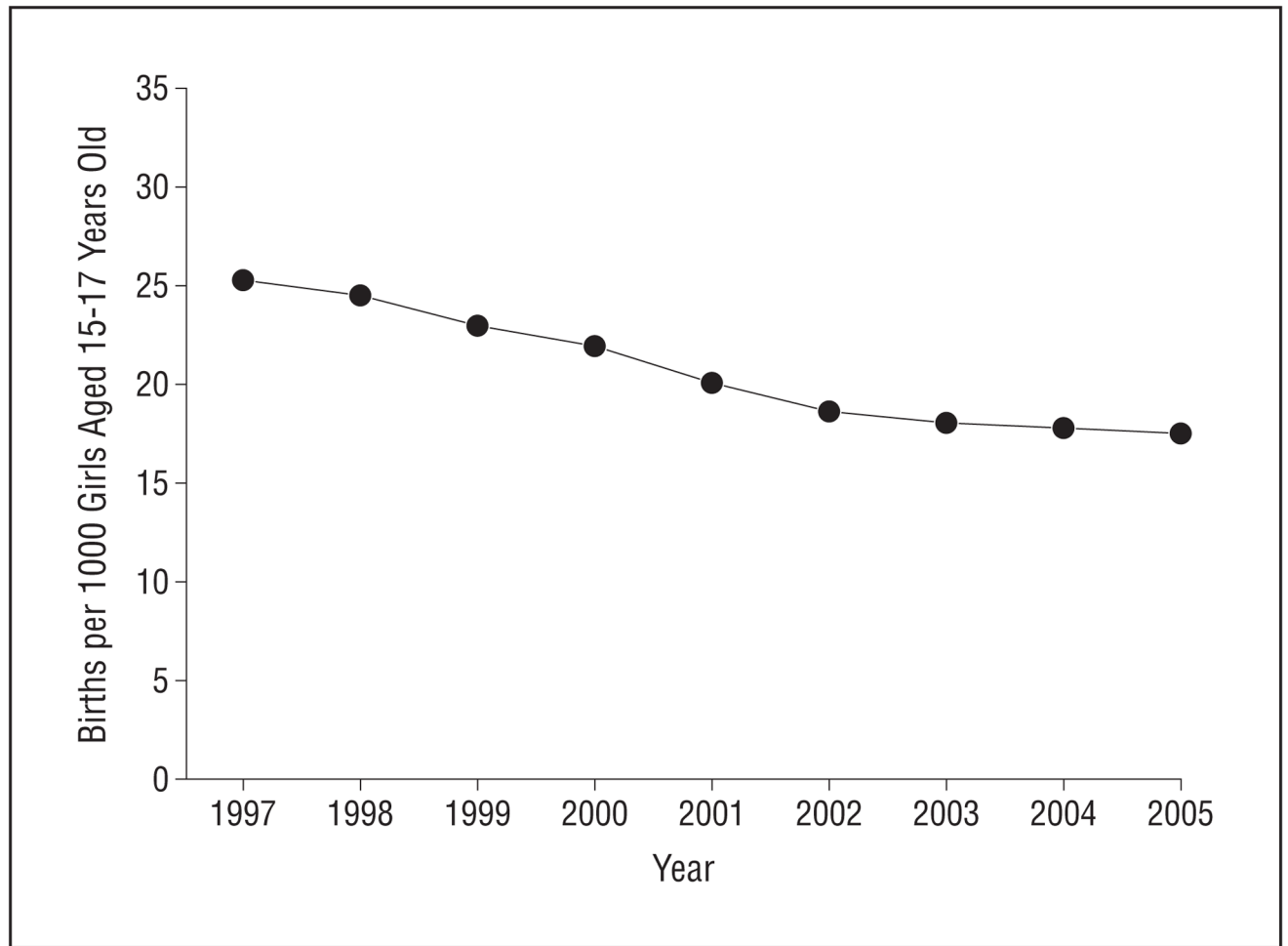
Figure.
Mean birthrates for girls aged 15 to 17 years over time for included states.

Table 1

Birthrates, Sexuality Education Scores, Demographic Characteristics, and Religious/Political Variables by State, 1997–2005

| State | | Mean (SD) | | | | Religiosity, Mean[f] | Abortion Law |
	Teenage Birthrates[a]	Average Score of All Sexuality Education Topics[b]	% of Children in Poverty[c]	% White[d]	Violent Crime Rate[e]		
Alabama	34.4 (5.9)	82.6 (4.7)	22.5 (1.2)	63.7 (0.2)	469 (47)	57.5	Parental consent
Alaska	21.0 (3.4)	68.8 (2.7)	12.9 (1.7)	65.1 (1.7)	619 (44)	29.8	Law enjoined
Arkansas	34.8 (5.0)	79.3 (1.5)	23.4 (1.2)	73.2 (0.5)	472 (41)	53.6	Parental consent
Connecticut	16.3 (3.8)	88.1 (1.3)	11.2 (1.7)	71.7 (0.3)	328 (37)	32.0	Minor allowed
Delaware	29.0 (5.1)	89.2 (1.8)	13.5 (1.3)	67.7 (0.8)	678 (69)	40.9	Parental notification
Hawaii	22.4 (4.1)	90.6 (1.8)	14.1 (1.6)	15.3 (1.5)	256 (14)	44.1	No law
Idaho	20.3 (3.4)	77.1 (4.3)	16.1 (1.1)	87.2 (0.8)	254 (12)	47.1	Law enjoined
Illinois	26.9 (4.7)	82.4 (1.1)	15.7 (1.0)	63.0 (0.4)	656 (113)	39.5	Law enjoined
Iowa	17.0 (1.7)	85.0 (2.4)	12.1 (1.6)	91.7 (0.8)	287 (16)	39.5	Parental notification
Maine	12.8 (1.7)	88.6 (0.9)	14.3 (1.2)	95.8 (0.5)	112 (7)	29.6	Minor allowed
Massachusetts	14.4 (2.9)	85.1 (0.7)	13.1 (2.0)	77.8 (0.5)	516 (71)	30.4	Parental consent
Michigan	20.3 (3.0)	80.4 (1.9)	15.7 (1.9)	76.8 (0.8)	555 (39)	40.8	Parental consent
Minnesota	14.9 (1.7)	87.2 (2.5)	10.4 (1.7)	86.2 (1.1)	284 (25)	38.1	Parental notification
Missouri	24.6 (3.3)	81.0 (2.6)	16.8 (1.5)	81.7 (0.7)	523 (32)	45.0	Parental consent
Montana	18.3 (1.2)	77.1 (3.4)	19.9 (1.2)	87.0 (1.2)	281 (78)	43.0	Law enjoined
Nebraska	19.4 (1.1)	75.4 (3.0)	12.9 (0.8)	85.8 (1.1)	350 (68)	41.9	Parental notification
New Hampshire	9.7 (2.5)	85.9 (2.8)	8.4 (1.4)	94.8 (0.4)	142 (30)	28.8	Law enjoined
New York	18.3 (3.7)	91.0 (1.4)	20.9 (1.9)	57.8 (0.5)	537 (88)	34.6	No law
North Dakota	12.9 (1.6)	76.0 (2.3)	14.7 (1.5)	90.0 (1.2)	85 (12)	40.5	Parental consent
Ohio	22.8 (3.4)	88.3 (3.9)	15.7 (1.5)	82.2 (0.7)	353 (34)	41.0	Parental consent
Tennessee	31.9 (4.5)	82.5 (1.1)	19.1 (1.2)	74.9 (0.7)	724 (33)	54.9	Parental consent
Utah	19.5 (3.1)	77.7 (3.1)	11.7 (0.9)	85.9 (1.3)	258 (34)	54.5	Parental notification
West Virginia	23.2 (2.4)	84.7 (2.0)	23.8 (1.1)	94.0 (0.4)	273 (41)	48.8	Parental notification
Wisconsin	17.7 (2.4)	87.8 (1.2)	12.6 (1.6)	84.2 (0.8)	237 (18)	35.8	Parental consent

[a]Live births per 1000 girls aged 15 to 17 years.

[b]An overall measure of sexuality education instruction across state levels in the form of an average score across all sexuality education topics.

[c] Percentage of children younger than 18 who live in families with incomes below the federal poverty threshold.

[d] Percentage of people in the state who are white.

[e] Violent crimes (ie, murder, rape and sexual assault, robbery, and assault) per 100 000 population.

[f] Average percentage of respondents who endorsed the most religious answer across 8 items.

Table 2

Descriptives of Sexuality Education Topics Over Time

Schools in the State Teaching Sexuality Education Topics, %	Mean (SD)					
	1996	1998	2000	2002	2004	
All topics						
Average score of all topics taught[a]	83.5 (5.3)	81.4 (6.3)	82.4 (5.8)	83.3 (6.5)	82.8 (5.2)	
Individual topics						
HIV infection prevention	96.3 (2.5)	95.7 (2.7)	96.8 (2.9)	96.6 (3.7)	96.1 (3.8)	
Pregnancy prevention	81.4 (8.2)	82.8 (7.9)	83.1 (7.3)	82.9 (7.9)	83.1 (6.2)	
Sexually transmitted disease prevention	93.2 (3.5)	93.0 (4.0)	91.0 (5.3)	91.3 (5.7)	91.5 (3.9)	
Abstinence as the most effective method to avoid HIV infection	96.6 (2.1)	92.9 (4.5)	94.5 (4.4)	93.5 (6.6)	93.6 (4.5)	
How HIV is transmitted	99.3 (0.6)	95.7 (2.8)	94.8 (3.6)	94.0 (5.7)	93.3 (4.1)	
Condom efficacy	73.3 (9.9)	70.8 (10.7)	70.2 (10.6)	69.1 (12.7)	68.0 (13.2)	
How to correctly use a condom	44.4 (15.0)	44.6 (15.4)	39.0 (15.0)	39.5 (15.1)	39.2 (16.2)	
No. of young people who get HIV[b]	...	...	87.5 (4.9)	84.7 (6.7)	84.0 (5.5)	
How to find valid information or services related to HIV/HIV testing[b]	...	76.1 (7.3)	80.9 (6.6)	77.9 (7.9)	77.8 (6.6)	
Human sexuality[b]	...	...	...	88.9 (6.0)	87.6 (5.6)	
Influence of alcohol and other drugs on HIV-related risk behaviors[b]	...	...	...	90.0 (6.6)	90.4 (5.8)	
How HIV affects the human body[b]	...	...	...	92.9 (5.7)	91.7 (4.4)	
Social or cultural influences on HIV-related risk behaviors[b]	...	...	...	81.5 (6.8)	80.6 (4.8)	

Abbreviation: HIV, human immunodeficiency virus.

[a] An overall measure of sexuality education instruction across state levels in the form of an average score across all sexuality education topics.

[b] Topics were not queried for all years.

Table 3

Sexuality Education Topics Related to Birthrates for 15- to 17-Year-Old Girls, 1997–2005

Schools Teaching Sexuality Education Topics in the State, %	Within- or Between-State Effect[a]	Unadjusted		Adjusted for Time Trend and Demographic and Religious/Political Variables[b]	
		β	P Value	β	P Value
All topics					
Average score of all topics taught	WS	-0.03	.38	-0.07	.10
	BS	-0.61	.001	-0.12	.26
Individual topics					
HIV infection prevention[c]	WS	-0.05	.39	-0.15	.01
	BS	-1.11	.004	-0.14	.48
Pregnancy prevention	WS	-0.01	.99	-0.02	.48
	BS	-0.27	.04	0.09	.18
Sexually transmitted disease prevention	WS	-0.01	.80	-0.04	.36
	BS	-0.66	.005	-0.16	.21
Abstinence as the most effective method to avoid HIV infection[c]	WS	0.01	.79	-0.02	.44
	BS	-0.79	.001	-0.06	.64
How HIV is transmitted[c]	WS	0.03	.40	<0.01	.95
	BS	-0.97	.002	0.05	.72
Condom efficacy	WS	<0.01	.85	-0.02	.33
	BS	-0.24	.006	0.11	.04
How to correctly use a condom	WS	0.01	.79	-0.01	.66
	BS	-0.19	.002	0.04	.39
No. of young people who contract HIV[c,d]	WS	-0.01	.80	-0.06	.10
	BS	-0.16	.45	-0.17	.16
How to find valid information or services related to HIV/HIV testing[c,e]	WS	-0.02	.34	-0.03	.20
	BS	-0.27	.07	-0.16	.12
Human sexuality[f]	WS	0.05	.54	0.04	.62
	BS	-0.46	.03	-0.11	.41
Influence of alcohol and other drugs on HIV-related risk behaviors[f]	WS	0.09	.27	0.09	.32
	BS	-0.28	.18	-0.24	.03
How HIV affects the human body[f]	WS	0.10	.34	0.12	.28

Schools Teaching Sexuality Education Topics in the State, %	Within- or Between-State Effect[a]	Unadjusted		Adjusted for Time Trend and Demographic and Religious/Political Variables[b]	
		β	P Value	β	P Value
	BS	−0.19	.45	−0.23	.09
Social or cultural influences on HIV-related risk behaviors[f]	WS	0.07	.28	0.05	.45
	BS	0.12	.57	−0.21	.08

Abbreviations: BS, between-state; HIV, human immunodeficiency virus; WS, within-state.

[a]Within-state effect, represented in the model by the state's time-varying deviation around its mean; BS effect, represented in the model by the state's mean on the time-varying covariate.

[b]Political ideology was explored for inclusion in the model in addition to the other political/religious variables, but it was highly correlated with many of the sexuality education topics and thus not included.

[c]Delaware was excluded from these models because this state was found to be influential.

[d]Topic was queried in all years except 1996 and 1998.

[e]Topic was queried in all years except 1996.

[f]Topic was queried only in 2002 and 2004.